

## Analysis of Antarctic Ice-Sheet Mass Balance from ICESat Measurements

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Published estimates of the mass balance of the Antarctic ice sheet have presented a wide range of uncertainty about the magnitude of the mass gain or loss, and conflicting evidence regarding acceleration or deceleration during the last two decades. For Greenland, results from ICESat for 2003 to 2007 showed the mass loss increased to 171 Gt/yr from the near balance in the 1990's. Similar analysis for Antarctica shows a positive balance of 38 Gt/yr for the period 2003 to 2008, which changed from a loss of about 31 Gt/yr for 1992 to 2001 (from analysis of ERS radar altimetry data) or a loss of 13 Gt/yr for around 2000 (from a modified estimate using the input-output method). Parts of the both the East and West Antarctic ice sheets and the Antarctic Peninsula are losing mass at increasing rates, but other parts are gaining mass at increasing rates. In West Antarctica, increased losses of 30 Gt/yr from the Pine Island, Thwaites-Smith, and Marie-Bryd Coast drainage systems are more than balanced by gains at the base of the Peninsula and three ice stream drainage systems (C. Kamb, D. Bindschadler, and E. MacAyeal), reducing the net loss from West Antarctica. In East Antarctica, some drainage systems also have increased losses, but the increased gains in the other systems are greater, giving a net increase in the mass gain for East Antarctica. Our estimate of the current mass gain for Antarctica is equivalent to a small reduction of 0.1 mm/yr in the rate of sea level rise.